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CASE REPORT

Effect of a lingual augmentation prosthesis for preventing salivation after subtotal glossectomy: A clinical report

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ABSTRACT

A lingual augmentation prosthesis (LAP) is an appliance attached to the mandible to increase swallowing by extending the denture base area. It has been proven that the swallowing function improves with the insertion of an LAP assisting the palatal augmentation prosthesis (PAP). We delivered both the PAP and LAP to a patient with subtotal glossectomy who experienced saliva drooling and masticatory dysfunction. As the dead space between the reconstructed tongue and dentures decreased in both the vertical and anterior directions, his maximum tongue pressure increased, and the status of salivation and food residue improved. LAP assisted not only for saliva drooling control but also mastication. (*Int J Maxillofac Prosthetics 2022;5:13-17*)

Keywords

Subtotal glossectomy, palatal augmentation prosthesis, lingual augmentation prosthesis, salivation, masticatory function.

AUDIOABSTRACTACT

INTRODUCTION

Patients with tongue cancer are normally treated with surgical excision and reconstruction with a skin flap. The palatal augmentation prosthesis (PAP) is an intraoral prosthesis used to rehabilitate the swallowing and speech articulation of the patient by increasing the pressure of the tongue, which assists in forming contact between the palate and tongue.[1,2]

However, for patients undergoing subtotal glossectomy, tongue movement is not only restricted in the vertical direction but also in the anterior direction, leaving a gap between the reconstructed tongue and the alveolar ridge. A lingual augmentation prosthesis (LAP) is an appliance attached to the mandible to increase swallowing by extending the denture base area.[3,4] It has been proven that the swallowing function improves with the insertion of an LAP assisting the PAP;[4] however, there is little information about the effect of an LAP on preventing salivation and masticatory function in patients with subtotal glossectomy. It is difficult for surgeons and prosthodontists to be completely recovered from salivation, the problem often persists till the end. We reported here that saliva drooling problems could not be improved only by PAP; however, with the assistance of an LAP, a better outcome could be observed.

CASE REPORT

A 66-year-old man who underwent right neck dissection and subtotal glossectomy from the right over the central area due to squamous cell carcinoma (cT3N2bM0) was referred to our clinic for the rehabilitation of speech, swallowing, and mastication in October 2012. Figure 1 shows the patient's intraoral views at the first visit. Glossectomy was performed in May 2012 and reconstructed with a rectus abdominis myocutaneous (RAMC) flap. This patient also received preoperative chemotherapy, including one course of treatment with CDDP (80 mg/m2 for 1 day) and 5-FU (800 mg/m2 for 5 days). Radiotherapy with chemotherapy (TS-1) was administered after surgery

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with 50 Gy (2 Gy/25 fr) for 5 weeks. Three months later, we delivered a new removal partial denture of the lower jaw and added the PAP to the present upper jaw denture. In August 2016, the patient was diagnosed with esophageal surface cancer, and endoscopic submucosal dissection (ESD) was performed. In December 2016, transoral laser microsurgery (TLM) was performed for laryngeal cancer.

Fig 1. Intraoral views at the first visit in October 2012.

As his lower jaw became edentulous after losing his remaining teeth, a new set of complete dentures was fabricated. In December 2018, complete dentures of the upper and lower jaws were delivered, and the PAP was added to the upper jaw denture. However, he was on the status of salivation, and we added LAP to the lower denture by extending the lingual base area (Fig 2).

At the first visit to our clinic in October 2012, the patient could only eat whole porridge (rice/water = 1/5) and kizami food (treated in size: 1 cm, 5 mm, etc.). Now, he can eat the same meals as the rest of his family (Fig 3), although eating takes him much longer than it does for others, suggesting that his swallowing and chewing ability have improved with the application of dentures with a PAP and an LAP.

Fig 2. Palatal augmentation prosthesis and lingual augmentation prosthesis in place in December 2018. Palatal augmentation prosthesis (A). Lingual augmentation prosthesis (B).

Fig 3. A menu and picture of dinner in December 2020 recorded by the patient. Deep-fried horse mackerel with cabbage and lemon, simmered hijiki seaweed, tomato salad, broccoli with sesame dressing, bean curd hot pot with garland chrysanthemum, and rice.

We evaluated the patient's oral function.

Maximum tongue pressure

The maximum tongue pressure was measured with a hand-held tongue pressure measurement device (JMS Co., Ltd., Hiroshima, Japan) (Fig 4A).[5]

A balloon probe was inserted into the center of the patient's reconstructed tongue (Fig 4B) according to the manual of the tongue pressure measurement device. The patient was instructed to fix the probe with his lip or artificial teeth of denture and lift his tongue against the palate for 10 s, through which the probe was interposed. The maximum pressure shown on the screen of a tongue pressure measurement device was recorded (Fig 4A). The patient's maximum tongue pressure was recorded three times under two conditions, as follows:
PAP and lower complete denture without an LAP in place (Fig 4C).
PAP and lower complete denture with an LAP in place (Fig 4D).
After three measurements, the mean maximum tongue pressure in the condition of without an LAP was 4.3 kPa, while with an LAP it was 6.5 kPa. His maximum tongue pressure increased by 2.2 kPa with an LAP.

Masticatory function

Food intake questionnaire (0-100 points).
We used Hirai's food intake questionnaire with 35 foods listed.[6,7] Figure 5 shows the results. His masticatory score was 48.3 points (range, 0-100 points).

Satisfaction levels with the visual analog scale (VAS) (0-100).
We checked his satisfaction levels for eating, chewing, appearance, speech, and denture with a visual analog scale (VAS), providing a range of scores from 0-100. According to this scale, a score of 50 was fair, 0 was the worst (absolute dissatisfaction), and 100 was the best (absolute satisfaction). The results are shown in Figure 6. His satisfaction levels for eating was 80, chewing was 70, appearance was 60, speech was 40 and denture was 70, respectively.

Menus and pictures of dinner for one week recorded by the patient

With the cooperation of the patient, we could obtain menus and pictures of his dinner for one week. For example, his dinner in December 2020 was a deep-fried horse mackerel with cabbage and lemon, simmered hijiki seaweed, tomato salad, broccoli with sesame dressing, bean curd hot pot with garland chrysanthemum, and rice (Fig 3). He was able to have the same meals with his family, indicating that his food texture and masticatory speed had gradually restored compared with that in the year 2012 when he had just undergone the glossectomy. The PAP and LAP sets had a positive effect on mastication.

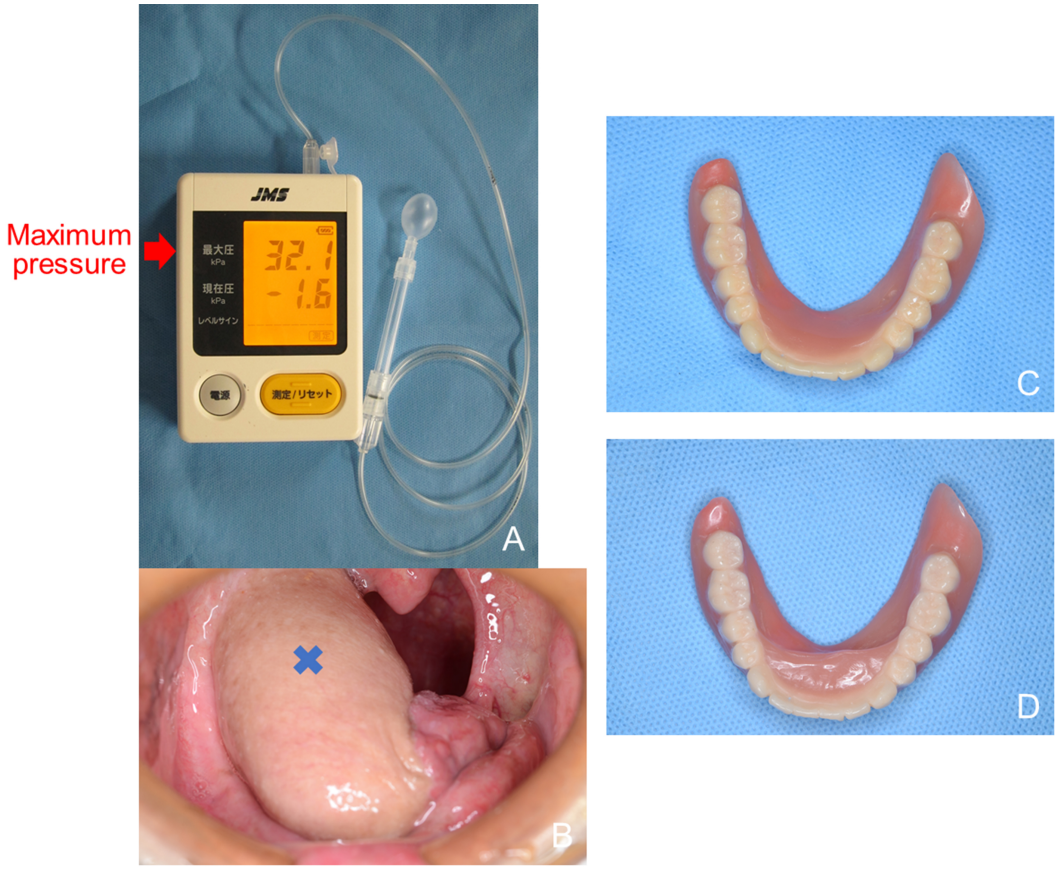

Fig 4. Tongue pressure measurement. Hand-held tongue pressure measurement device (JMS Co., Ltd., Hiroshima, Japan) (A). Measurement point (B). Without LAP (C). With LAP (D).

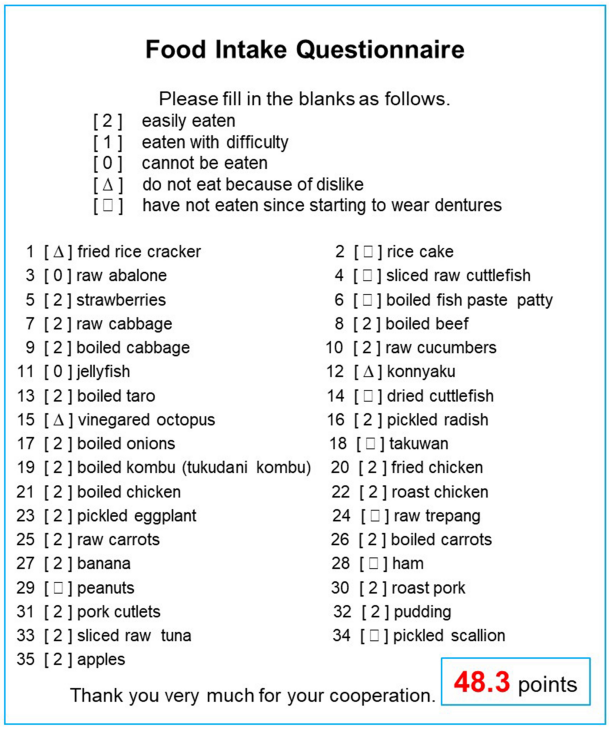
Food Intake Questionnaire
Please fill in the blanks as follows.
[2] easily eaten
[1] eaten with difficulty
[0] cannot be eaten
[Δ] do not eat because of dislike
[□] have not eaten since starting to wear dentures
1 [Δ] fried rice cracker
2 [□] rice cake
3 [0] raw abalone
4 [□] sliced raw cuttlefish
5 [2] strawberries
6 [□] boiled fish paste patty
7 [2] raw cabbage
8 [2] boiled beef
9 [2] boiled cabbage
10 [2] raw cucumbers
11 [0] jellyfish
12 [Δ] konnyaku
13 [2] boiled taro
14 [□] dried cuttlefish
15 [Δ] vinegared octopus
16 [2] pickled radish
17 [2] boiled onions
18 [□] takuwan
19 [2] boiled kombu (tukudani kombu)
20 [2] fried chicken
21 [2] boiled chicken
22 [2] roast chicken
23 [2] pickled eggplant
24 [□] raw trepang
25 [2] raw carrots
26 [2] boiled carrots
27 [2] banana
28 [□] ham
29 [□] peanuts
30 [2] roast pork
31 [2] pork cutlets
32 [2] pudding
33 [2] sliced raw tuna
34 [□] pickled scallion
35 [2] apples
Thank you very much for your cooperation.
48.3 points

Fig 5. Hirai's food intake questionnaire with 35 foods listed (0-100 points). Konnyaku = a paste made from the starch of the devil's tongue plant; taro = Japanese taro potato; takuwan = harder to masticate than pickled radish; kombu = tangle weed; trepang = sea cucumber.

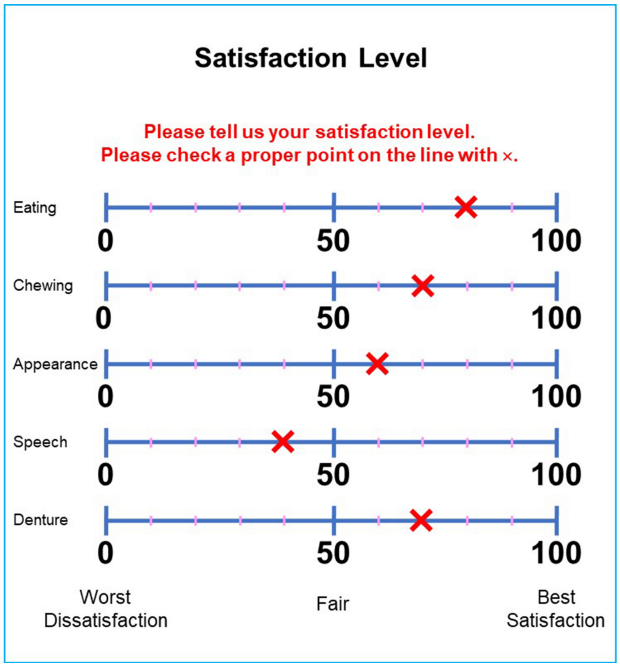

Fig 6. Satisfaction levels with the visual analog scale (VAS) (0-100).

DISCUSSION

At first, glossectomy was performed in May 2012; then, ESD was performed for esophageal surface cancer in August 2016 and TLM was performed for laryngeal cancer in December 2016. As the swallowing function of the patient worsened with each surgery, it caused salivation. Although there have been some reports on how LAP accompanied by PAP improved swallowing, there have been few surveys focusing on how the maximum tongue pressure changed with the help of an LAP and how patients' food intake and satisfaction levels for masticatory function were.

A PAP was delivered to the patient due to restricted tongue movement, which facilitated contact between the tongue and the palate and improved bolus transportation from the oral cavity to the pharyngeal cavity. However, saliva and food residues were found in the gap between the reconstructed tongue and the anterior floor of the mouth after speaking, swallowing, and mastication. Therefore, an LAP was added to the lower denture to fix the gap and restore contact between the reconstructed tongue and anterior lower denture, saliva residue decreased, and food transportation improved by the decreasing dead space in the anterior direction. While the LAP alleviated saliva drooling and improved mastication performance by reducing the oral space, we should be aware that speech and the volume of food intake would be affected by the size of the LAP.

According to Utanohara et al.,[8] the mean maximum tongue pressure of normal people in their 70s should be 31.9 ±8.9 kPa, and at least 20 kPa is necessary to ensure that the patient does not have oral hypofunction.[9] The patient's maximum tongue pressure of 6.5 kPa increased by 2.2 kPa after wearing the LAP. In cases such as subtotal glossectomy, it was suggested that even a slight increase in maximum tongue pressure could prevent drooling.

Comparing the food texture 5 months after surgery and the recent food intake questionnaire (Fig 5), his masticatory performance obviously improved from whole porridge and kizami food to 48.3 points on a scale of 0-100 points. Furthermore, the patient was satisfied with eating (VAS = 80) and chewing (VAS = 70) (Fig 6), as he could eat the same meals as the rest of his family, this was clear from the menus and pictures of dinner taken by the patient over one week (Fig 3).

CONCLUSION

We delivered both the PAP and LAP to a patient that underwent subtotal glossectomy and experienced saliva drooling and masticatory dysfunction. As the dead space between the reconstructed tongue and dentures decreased in both the vertical and anterior directions, his maximum tongue pressure increased, and the status of salivation and food residue improved. The LAP aided not only in saliva drooling control but also in mastication.

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